IES Newsletter

Volume 4, Number 6
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Director's Note

The October 4th snowstorm was severe and left very few people in the mid-Hudson Valley and western New England untouched. But was it an environmental disaster?

Major natural disturbances (such as windstorms and floods) are not uncommon. Left to their own devices, plants and animals adapt to the changed living conditions, and the system eventually recovers.

One of the Institute's goals is to study the effects of disturbance and the process of recovery in ecosystems of the northeastern United States. IES scientists are already well into an analysis of the effects of the snowstorm, as you will see from the following article.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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Environmental Disaster? ... or "Major Pruning"?

On Sunday, October 4th, over 30 centimeters (12 inches) of heavy, wet snow fell on parts of the Northeast. Nature is more or less ready for such a storm by the time the winter months come, but deciduous trees are not prepared to cope with this kind of assault before the leaves fall from their branches. The weight of so much early snow on the leaves broke off branches, split trunks and toppled whole trees.

Within a few weeks, roadside debris had been removed, homeowners had cleaned up their yards, and the thousands of individuals who had lost power had restocked their freezers and put away their candles. But, in the forests, the effects of the storm remained clearly evident: pale, jagged scars of broken treetops; "widow-makers" (a term coined by lumberjacks to describe branches dangling from the forest canopy) at every turn; leaf-laden branches on the forest floor.

Tree damage at the Mary Flagler Cary Arboretum was considerable. Within days of the storm, Drs. Steward Pickett, Mark McDonnell, Charles Canham and Alan Berkowitz, IES ecologists studying terrestrial plant communities, put together a team to assess the damage and lay out a plan for long-term observations of the recovery process.

It was important to do a survey immediately to record what direct effects the storm had on trees in the various habitats on the Arboretum, especially in those areas with a closed or nearly closed canopy. Ten transects for study were set up: some in the lowlands, along the floodplain of the East Branch of the Wappinger Creek; some in the densely wooded area behind the Greenhouse; and the majority in the Cannoo Hills, both in forest and oldfields sites.

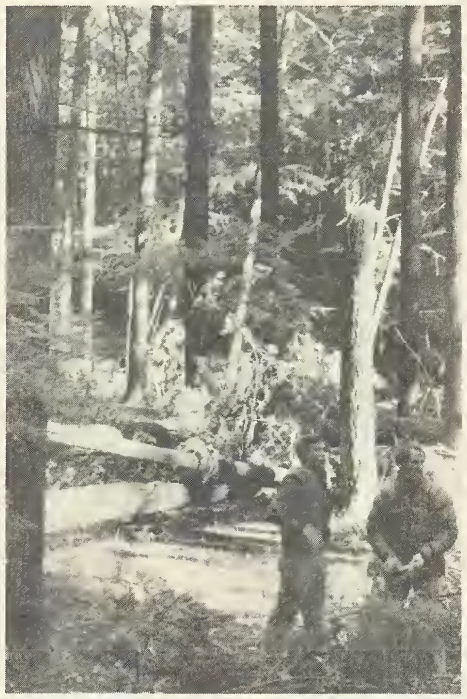
The transect lines are 300 meters (984 feet) long. There are 15 points along each, set at random so that an unbiased sample is guaranteed. The scientists and their research assistants selected the four trees closest to each point for their survey. They identified the species and noted the extent of the damage, from no damage at all, to the number of broken branches, to total uprooting. The points and the selected trees were permanently marked, allowing the scientists to make future observations of the trees' growth, health or mortality.

In addition, at each point along the transect line a 20 meter (65.6 foot) transect was placed at right angles. The amount of debris brought down by the storm was measured along each of these lines. These transects will be monitored over a period of time to find out what normally falls from the trees as well as what comes down in storms. These data will show how much biomass is taken from the forest canopy by different disturbances.

The piles of debris on the forest floor may alter the ecology of the area, and the research team will be in the position to monitor such changes. For example, slash piles could provide shelter for gypsy moths. Gypsy moths are always present in a forest, but their numbers fluctuate and outbreaks occur only at intervals. Does an ecological disturbance have any effect on the timing of outbreaks? Dr. Clive Jones, IES chemical ecologist involved in long-term monitoring of gypsy moth populations at the Arboretum, will be assisting in this aspect of the team study. What if, on the other hand, the piles provide shelter for small mammals that eat gypsy moths? IES wildlife ecologist Jay McAninch will be on hand to contribute to that part of the research effort.

While some trees may eventually die as a result of storm damage, from such things as fungal infections in open wood, most of the forest will adapt and continue to grow. The IES ecologists choose to look at the storm as a "major pruning", not an environmental disaster. They feel that for the next five years or so the major effect will be the increased amount of light reaching young trees and shrubs on the forest floor -- perhaps by the end of that

continued on page 4



STEWARD T.A. PICKETT

IES Plant Ecologist Dr. Charles Canham, right, and Dr. Steve Pacala, a plant ecologist from the University of Connecticut, surveying storm damage.

Forest Response to a Natural Catastrophe

When tornadoes hit the Allegheny National Forest in western Pennsylvania on May 30th, 1985, they devastated the forests on 364 hectares of the 1659-hectare Tionesta Scenic and Research Natural Area (900 of 4100 acres). This freak happening ... such events are estimated to occur in dense forests only once every thousand years ... provided ecologists with a rare opportunity to learn about the role of natural disturbance in the dynamics of forest communities.

Forest ecologists want to learn more about how trees compete for the resources of soil, water and light. They are particularly interested in seeing what happens to seedlings and small trees when mature trees are removed from the forest and are therefore no longer competing for these resources. Research on forests, however, poses certain challenges. Greenhouses provide limited capabilities for observations of trees, and most disturbances in nature, such as forest fires or logging, affect the whole ecosystem -- the soils, animals and lower plants as well as the tree species. It is rare that ecologists have the chance to work in an area where disturbance is primarily limited to the mature trees.

Tionesta, a small part of the Allegheny Forest, is one of the few remaining large stands of virgin forest in the eastern United States. Hemlocks (*Tsuga canadensis*) are dominant, and yellow birch *(Betula lutea)*, black birch *(Betula lenta)*, beech *(Fagus grandifolia)*, black cherry *(Prunus serotina)* and three species of maple *(Acer* spp.) are also common. During the tornadoes, most of the mature trees -- many of them 300 to 400 years old -- were either uprooted or snapped off to leave only stumps. Young trees under a meter high (approximately a yard) escaped the fate of their taller neighbors, although many were flattened by falling debris.

Dr. Steward Pickett, an IES plant ecologist, and Chris Peterson, his graduate student at Rutgers University, have taken advantage of the research opportunities provided by the Tionesta blowdown. Since July 1986 they have been observing and recording the natural recovery processes occurring there. Three parallel transect lines, one kilometer (0.6 mile) in length each, were set up across the 0.5 km wide tornado path, beginning and ending in the undamaged forest on either side. Research plots along these transects were selected to represent the conditions of light, soil and drainage typical of the affected areas. Within the plots, each plant species and its status were recorded.

In an undisturbed forest, beech trees are common as ground cover but grow slowly in the shadows of taller trees. In the tornado zone, report Pickett and Peterson, young beech are now dominant. However, yellow birch, which grow slightly faster, and the even more rapidly growing, but less numerous, black cherry are starting to provide some competition. Dr. Pickett feels that it is likely that in a few years the birch and cherry will overtake the beech, which may not become dominant until much later.

The effects of the white-tailed deer on regeneration of tree species are also being studied. These mammals are common is the Tionesta area. Mr. Peterson reported in a recent article in the British journal *New Scientist* that he has "never seen a hemlock seedling more than 5 centimeters tall ... anything larger than that, the deer have already eaten". Deer prefer hemlock but also like maples and black cherry and usually avoid beech; however, the very dense deer herd has severely browsed even the beech. Since beech sprout profusely from the roots, some manage to "escape" even when severely browsed. But these young survivors aren't "out of the woods" yet: gypsy moth caterpillars prefer beech, and Peterson noted that "in a few parts of the blowdown there are beech with no leaves at all". Such interactions are going to be determining factors in the outcome of the beech - birch - black cherry competition for dominance.

In addition to making observations of the natural regeneration processes at the Tionesta blowdown, Pickett and Peterson are manipulating the environment at selected sites along their transect lines. Wire fences have been put around some of the plots to keep deer away from the growing trees; this protection will show how great an effect the browsing mammals have on the survival of individual plant species. In some other plots, debris has been removed so that the ecologists can compare the growth of young trees in areas exposed to full light with the growth of those in areas shaded by debris.

Pickett and Peterson will record their observations over a four-year period, and will need to restudy the site for at least 10 years in order to gain a complete picture of the early stages in the re-establishment of a forest. Nature has provided them with an ideal field laboratory for studying disturbance and recovery in an ecosystem, and they are taking full advantage of the opportunity.

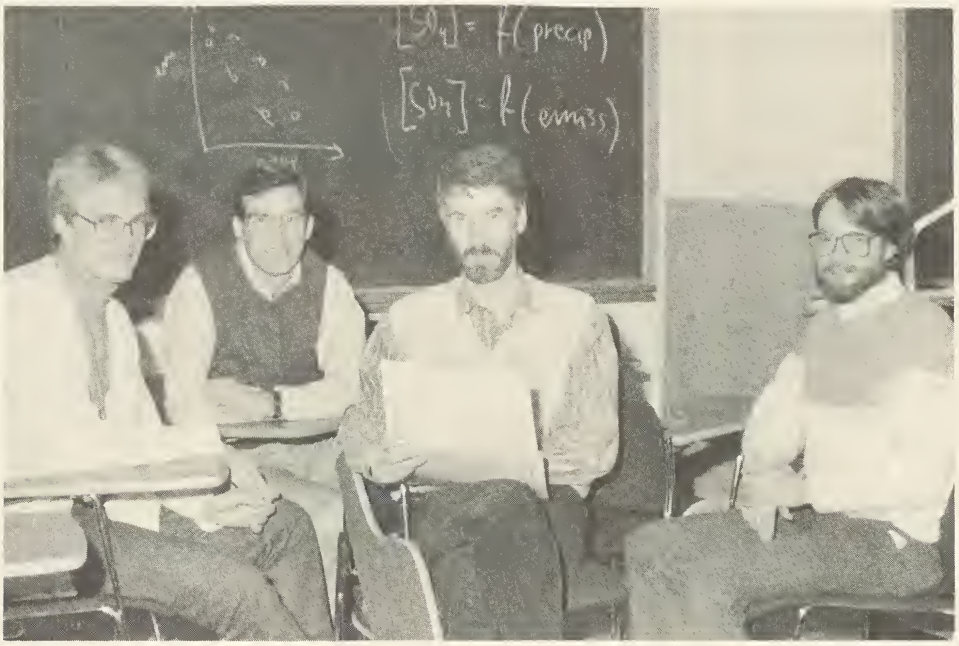
LINDA DOWNEY

IES ecologists are becoming more involved in public policy issues -- zoning, development, landfills, atmospheric quality as it relates to questions on a state level, and others. On October 9th at the Institute, the staff met with professionals experienced in matters of public policy for an open discussion of these issues as they relate to IES research goals. The dialogue will be continued with relevant members of the Department of Environmental Conservation staff at a meeting to be held in Albany. From left to right: Nicholas A. Robinson, Professor of Law and Director of the Center for Environmental Legal Studies, Pace University (White Plains, NY); Dr. Richard L. Ottinger, Professor of Law, Pace University; Dr. Gene E. Likens, Director, Institute of Ecosystem Studies; and Thomas C. Jorling, Commissioner, New York State Department of Environmental Conservation.

Visitors to IES

Dr. David Grover Frey is an internationally known limnologist who recently retired as professor of zoology at Indiana University in Bloomington, Indiana. His research interests were the developmental history of lakes and the micropaleontology of lake sediments as well as the systematics, ecology and evolution of cladoceran species (microscopic freshwater animals related to crabs and crayfish). Over his years of research, Dr. Frey built on an extensive pre-existing Indiana University collection of written materials dealing with limnology - the study of lakes, ponds and streams - and upon his retirement wished to donate the entire collection to a place where it would be most useful. He and IES Director Dr. Gene Likens have been acquainted for many years, and he realized that the Institute was the proper home for the collection. The limnology collection arrived here in July 1986. It is being catalogued, and Librarian Annette Frank reports that is contains approximately 20,000 monographs, serial publications and reprints in eleven languages. The collection is not only complete, but also historically interesting: limnology is a relatively recent research field in the United States, but this collection includes European journals that extend back to the 1930's. Dr. Frey, a Visiting Scientist at the Institute, was here in late October and was photographed (right) with Ms. Frank and Dr. Likens.


GLYN CLOYD



GLYN CLOYD

Meteorologist Dr. Lennart Granat is doing research in atmospheric chemistry at the University of Stockholm in Sweden. Early in November he spent a week at the Institute, working with Dr. Gene Likens and Lars Hedin, a Yale University graduate student doing his Ph.D. research at the Institute and at the Hubbard Brook Experimental Forest (New Hampshire). The three are collaborating on a project to compare long-term records of precipitation chemistry in Europe and the northeastern United States. A discussion group on acid rain during Dr. Granat's visit brought together experts in the field. Shown here are, left to right: Mr. Hedin; IES Plant Ecologist Dr. Gary Lovett; Dr. Granat; and Dr. Charles Blanchard, an atmospheric chemist at Princeton University.

Volunteer's Bequest

IES volunteers are a hard-working, loyal and supportive group, and their interest in Institute and Arboretum programs is frequently broad. This is exemplified by the case of Miss Dorothy Patricia Hough.

Pat Hough, a resident of Pawling, New York, did volunteer work in the IES Greenhouse from late 1982 through early 1985. She enjoyed her work tremendously, thanks in part to the excellent tutelage of Greenhouse Manager David Bulkeley, and her interest grew to include other IES activities as well. She asked Mr. Bulkeley how she could help the Institute, and he suggested that the Perennial Garden was a worthy cause.

She died in November, 1985. Recently, IES Administrator Joseph Warner received formal notification that she left nearly $250,000 to the Institute, stipulating that the income from this bequest be used in support of the recently completed Perennial Garden. Pat Hough's bequest will establish an endowment fund, the income from which will support a gardener's position.

New Staff

JUDIANE KOCH (right), research assistant I, joined the IES rights-of-way project in June as a summer field research assistant. She has just accepted a permanent position working for Plant Ecologist Dr. Charles Canham, in which her responsibilities include coordination of the Greenhouse research for the rights-of-way vegetation study and of the project's laboratory analysis. She will also be involved in some field work. Ms. Koch has a bachelor of arts degree in biology from Vassar College in Poughkeepsie.


GLYN CLOYD

Pruning ... *from page 1*

period a casual bystander might not even be aware that there had been such a storm. As a result of the baseline studies done in the weeks following the storm, however, the ecologists will be in a position to see whatever lasting effects there might be in the forest community, and to know how these changes are related to the October 4th transient event. Relevant findings will be reported in the IES Newsletter.

Protecting Damaged Trees

Bradley Roeller, manager of display gardens at the Arboretum, has the following hints for tree owners who want to protect damaged trees from possible infection:

1. Make sure that pruning cuts are made at an angle, especially cuts that are larger than 15 cm (6") in diameter. Angled cuts will shed water, while flat cuts will catch moisure from rain, ice and snow, encouraging rot.
2. Cuts greater than 5 cm (2") in diameter should be painted with tree wound paint, to seal the wood from moisture.
3. Where large sections of the tree are broken, for example major limbs or parts of the trunk, be certain that cuts are made to shed water. Often the cut has to be shaped to create a 'drain spout'.

Winter Calendar

ADULT EDUCATION PROGRAM

The Institute is pleased to announce its winter and spring semester courses in landscape design, gardening, botany and ecology:

Winter Semester

Landscape Design I. Site Analysis and Schematic Design
Graphics
Floriculture
Annuals and Perennials for Landscaping
Growing Herbs Indoors
Intensive Organic Gardening
House Plant Clinic

Spring Semester

Landscape Design Theory
Construction I. Grading and Drainage
Landscape Design II. Plan Development
Drawing for Plan Presentation
Insect Pests and Diseases of Plants
Plants for Landscaping: Woody Perennials
Spring Mushrooms
Frontiers in Ecology

Special Workshops

Plant Propagation and Management for Ecological Landscaping
Ecological Design and Landscape Restoration
Airphoto Interpretation and Land Use: An Introduction to Basic Techniques
Planting and Transplanting Trees and Shrubs

For registration information, or to be put on the mailing list for the Adult Education Program catalogue, call the Gifford House at the number below.

ECOLOGICAL EXCURSIONS

Join us for one or more of the following trips:

A Lake in Winter: Frozen Ecology (January 31st)
Winter Ecology of the Bald Eagle (February 6th)
Wildlife in Winter: Bear Watch (March 7th)
The New York Flower Show (March 10th)
Archaeology and Implements (May 18th)
Spirit of Northern Waters (May 20th)
Garden in the Woods (June 9th)
The Ecology of Tivoli Bay: An Exploration by Canoe (June 11th)

SUNDAY ECOLOGY PROGRAMS

Free public programs are offered on the first and third Sunday of each month. All programs are from one to two hours long, and begin at 2:00 pm at the Gifford House unless otherwise noted.

Tentative schedule (please call (914) 677-5358 to confirm the day's topic):

Jan. 17th: Winter Green: Focus on Conifers (Kass Hogan) - Walk
Feb. 7th: Vegetation of North and Central America (Steward Pickett) - Talk
Feb. 21st: Identifying and Controlling Wildlife Damage in Yard and Garden (Ray Winchcombe) - Walk/Talk
Mar. 6th: Ecosystem Recovery on Mount St. Helens (David Wood) - Talk
Mar. 20th: Visit to a Tropical Island (Mark Mattson) - Talk

For ecology walks, dress for the weather conditions; wear warm, waterproof boots. In case of inclement weather, call (914) 677-5358 after 1 pm to learn the status of the day's program.

Ecology talks are slide presentations or demonstrations held indoors at the Gifford House.

GREENHOUSE

The IES Greenhouse performs double-duty: it is a year-round tropical-plant paradise as well as a site for controlled environmental research. The public is invited to explore both aspects during Arboretum hours. There is no admission fee, but visitors should first stop at the Gifford House for a free permit.

SCIENTIFIC SEMINARS

The Institute's weekly program of scientific seminars features presentations by visiting scientists or Institute staff. All seminars take place in the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

ARBORETUM HOURS

Monday through Saturday, 9 a.m. to 4 p.m.; Sunday, 1 - 4 p.m. The Gift and Plant Shops are open Tuesday through Saturday 11 a.m. to 4 p.m.; Sunday 1 - 4 p.m. Closed on public holidays. (Also closed during the deer hunting season and when the internal roads are snow covered.) All visitors must obtain a free permit at the Gifford House for access to the Arboretum.

MEMBERSHIP

Take out a membership in the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, six issues of the IES Newsletter each year, free subscription to *Garden* (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is $25; family membership is $35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

For more information, call (914) 677-5358 weekdays from 8:30-4:30.

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